

## **REMARKS**

### **The Amendments**

With this amendment, claims 1 and 19-37 are pending herein.

Claim 19 has been amended to indicate that the "polymer matrix incorporates amine groups that are complexed with transition metal cation". By this amendment, the polymeric beads are no longer simply "capable of complexing" transition metal cation but rather are defined in a form that is "complexed with transition metal cation". Support for this amendment may be found throughout the specification inasmuch as the invention as it is described relates to using the polymeric beads for complexing transition metal cations. In particular, the specification at lines 4-9 on page 13 clearly contemplates the polymeric beads being used in a process that produces the polymeric beads complexed with transition metal cations.

Claim 21 has been amended to depend from claim 19 and also to agree with the amended form of claim 19. In particular, claim 21 now includes a step of "contacting the so-formed polymeric beads with an aqueous solution comprising transition metal cations such that the amine groups of the beads complex with the transition metal cations". Support for this amendment again may be found throughout the entire specification, e.g., lines 4-9 on page 13 of the published PCT specification.

Claim 36 has been amended to depend from claim 19.

### **The Information Disclosure Statement**

The Office Action requests a listing of pre-grant publications corresponding to the U.S. pending applications listed in the Information Disclosure Statement filed June 23, 2008. Upon review of the Information Disclosure Statement filed June 23, 2008, no patent applications were found to have been listed. It is assumed the Office Action is referring to the applications disclosed in previous Information Disclosure Statements. It is noted

that US 1190863 is an issued U.S. patent, Come et al., issued July 11, 1916, and available on the public database of the USPTO.

### **Explanation of the Distinction Between Complexing and Ion-exchange Resins**

Before dealing with the specific prior art rejections, we present the following explanation to define the important claim term, "complexing resin," and distinguish it from an "ion-exchange resin." A complexing resin is not equivalent to an ion-exchange resin.

The key to understanding the difference between the presently-claimed resin and those described in the references is an appreciation of the distinction between a "complexing resin" as claimed herein and an "ion-exchange resin" as disclosed in the cited references.

An ion-exchange resin is known in the art as a resin containing functional groups **having ionic charge** that is neutralized with either a negative or positive counter-ion. Upon being exposed in a solution containing solubilized cations or anions, the counter-ions associated with the resin exchange with the ions in the solution. Removal of the now "exchanged" ion-exchange resin from the solution therefore results in the ions originally in the solution being removed and counter-ions originally associated with the resin remaining in the solution. Resins that provide for such a net process are therefore known in the art as ion-exchange resins.

In contrast, a complexing resin is known in the art as a resin containing functional groups in a **neutral state** having an electron pair available for coordinating or complexing with a Lewis acid such as a transition metal cation. A person skilled in the art would appreciate that the process of complexation is a combination process that does not involve any exchange whatsoever. Thus, in the context of the present invention, the complexing resin comprises amine groups capable of complexing a transition metal cation. Upon being exposed in a solution containing solubilized transition metal cations, the neutral electron pair donor functional group (*i.e.*, the amine

(N) group) associated with the complexing resin forms a complex with the solubilized cations. Removal of the now "complexed" complexing resin from the solution removes the cations originally in the solution without anything from the resin being exchanged back into the solution.

By virtue of the different chemical nature of complexing and ion-exchange sites, and the different mechanisms by which each site operates, complexing resins and ion-exchange resins have different capabilities and inherently present a different net effect in use.

To further elucidate the difference between ion-exchange and complexing resins, the Applicants provide contrasting schemes illustrating the ion-exchange process and the complexing process, attached hereto as Exhibit A. The ion-exchange resin (Scheme 1) exchanges its counter ion  $X^-$  with an anion  $Z^-$  so as to form an "exchanged" ion-exchange resin comprising the "ion pair"  $-NR_3^+Z^-$ , with the original counter ion  $X^-$  remaining free in solution. In contrast, a complexing resin is known in the art as a resin containing functional groups in a neutral state having an electron pair available for coordinating or complexing with a Lewis acid such as a transition metal cation. In particular, the process of complexation is a combination process that does not involve exchange. With reference to Scheme 2, the neutral amine group (i.e.  $-NR_2$ ) provides an electron pair that coordinates with a transition metal cation (i.e.  $Z^+$ ) so as to form a coordination complex. The Examiner will appreciate that the amended form of the claims are now directed toward this coordination complexed resin and not the resin prior to complexation.

From Schemes 1 and 2 it can be clearly seen that not only is an ion-exchange process mechanistically different from a complexation process, but notably, the form of the ion-exchanged resin and the complexed resin are entirely different (i.e. the former presents an "ion-pair" whereas the latter presents a "coordination complex").

**The Rejection under Section 103(a) over Rembaum et al.**

The Office Action rejected claims 19-37 under 35 U.S.C. 103(a) as allegedly being unpatentable over Rembaum et al. (US 4,123,396). The Office Action states:

US 4,123,396 to Rembaum et al. discloses amine containing polymeric microspheres impregnated with magnetically attractive metallic particles (see abstract; col. 2, lines 50-54). Suitable amine containing polymers include those derived from vinylpyridine, vinylbenzimidazole and ethylene imine, which may further copolymerized with other amino group-containing monomers such as dimethylaminomethacrylate, aminoalkyl (meth)acrylates, and polyunsaturated crosslinking comonomers such as N,N-methylene-bis-acrylamide (col. 3, line 31 to col. 4, line 33). The control of desirable stoichiometric amount of metal to amine functionality is taught to enhance desirable catalytic activity of the resultant microspheres (col. 3, lines 8-11). Prior art further teaches the incorporation of stabilizing agent to the aqueous polymerization system, functioning within the scope of the instant dispersing agent, taken the broadest interpretation of the recited dispersing agent (col. 4, lines 34-45).

Applicants' June 4, 2007 reply to the Restriction Requirement of March 8, 2007 addressed the relevance of Rembaum et al. and in the subsequent Office Action dated July 12, 2007 this reference was not cited against the present application. Accordingly, it appeared that the Examiner had in effect withdrawn the rejection relating to this document.

The Applicants maintain that Rembaum et al. fail to disclose or suggest polymeric beads of the type defined in the application. In particular, this reference discloses metal/metal oxide-containing microspheres used in catalysis reactions, labeling applications and separation/analysis of protein materials. Notably, the reference fails to disclose or make any suggestion whatsoever of using the microspheres as a complexing resin for separating transition metal cations. Having said this, the process of preparing the microspheres does involve forming a coordination complex between amine groups of the microspheres with metal cations. In particular, the microspheres are formed by first preparing the microspheres comprising amine functionality. The amine-functionalized microsphere is then complexed with metal salts which are in turn reduced to form finely divided free metal or metal oxide particles. In other words, the coordination complex serves only as an intermediate on the way to

preparing the microspheres comprising the finely divided free metal or metal oxide particles. Those skilled in the art will appreciate that upon being reduced the complexed metal salt transitions to non-complexed free finely divided metal or metal oxide particles. Notably, the process of preparing the microspheres also does not include a dispersing agent to assist dispersing magnetic particles throughout the polymer matrix of the microsphere. In particular, those skilled in the art will appreciate that because the metal or metal oxide particles are formed *in situ* after the microsphere polymer matrix is formed, a dispersing agent for the particles would serve no practical use (i.e., the dispersing agent only serves a purpose if the particles are present within the liquid composition used to prepare the polymer matrix). Thus, there would be no motivation to modify the resin of this reference to include a dispersing agent as is claimed herein. In consequence, no *prima facie* case of obviousness has been made out.

Accordingly, it is submitted that Rembaum et al. not only fails to disclose polymeric beads comprising a dispersing agent that is dispersed substantially uniformly throughout the polymer matrix of the beads, but the reference also fails to disclose or suggest a polymer bead product having magnetic particles substantially uniformly dispersed therethrough and a polymer matrix that incorporates amine groups complexed with the transition metal cation. In their amended form, the claims of the application are therefore believed to be both novel and non-obvious in the light of this reference.

#### **The Rejection under Section 103(a) over Weiss et al.**

The Office Action rejected claims 19-37 under 35 U.S.C. 103(a) as allegedly being unpatentable over Weiss et al. (US 4,144,373). The Office Action states:

US 4,144,373 to Weiss et al. sets forth composite adsorbent beads comprising adsorbent particles and magnetic particles embedded in a porous matrix of organic polymers (see abstract; col. 2, lines 9-53). Suitable organic polymers and magnetic particles include poly(meth) acrylamides and magnetite, respectively (col. 2, lines 20-35; col. 5, Example 1). Prior art further suggest pre-coating the magnetic particles using suitable organic polymer materials via conventional techniques (col. 2, line 36 to col. 3, line 8) so as to minimize corrosion of the

particles. Taken the broadest interpretation of the recited dispersing agent, prior art particle surface treating polymer and other surface active agents fall within the scope of the instant dispersing agent. Additional solvents and surfactant are suggested to produce the resultant bead dispersion (col. 4, lines 10-18).

Weiss et al. relates to polymer composite materials suitable for separating organic material from a solution by size exclusion. The polymer composite materials disclosed do contain magnetic material contained within a polymeric matrix. However, it is submitted that the manner in which the composite materials are said to be produced does not involve the use of a dispersing agent for dispersing the magnetic material within the polymer matrix of the composite material. Accordingly, the document does not disclose or teach in any way polymer beads comprising a dispersing agent substantially uniformly dispersed throughout the polymer matrix of the beads. Furthermore, and most notably, the document is not related in any way to complexing resins or the use of such resins in separating transition metal cations. In particular, the document makes no reference or suggestion whatsoever of polymeric beads of complexing resin incorporating amine groups that are complexed with transition metal cation. Accordingly, in their amended form the claims of the present application are believed to be both novel and non-obvious in the light of this document.

#### **The Rejection under Section 103(a) over Ballard et al.**

The Office Action rejected claims 19-37 under 35 U.S.C. 103(a) as allegedly being unpatentable over Ballard et al. (US 6,171,489). The Office Action states:

US 6,171,489 to Ballard et al. disclose and exemplify polymer beads and method for their preparation. Prior art polymer beads products are identical to those presently claimed and prepared by the identical dispersion polymerization process as used by applicant (see abstract; col. 7, lines 11-30; working Examples). Specifically, said dispersion contains a continuous aqueous phase, an organic dispersed phase containing a functional monomer and a crosslinking monomer, magnetic particles (i.e.  $\gamma\text{-Fe}_2\text{O}_3$ ), solid dispersing agent is used in the formation of polymer beads (col. 2, lines 50-61; col. 3, lines 25-64; col. 5, lines 1-29). Suitable crosslinking monomer, functional monomers include the presently recited amine group-containing monomers and those which can be post-reacted to form the amine functionality (col. 4, lines 5-15) are disclosed. The resultant polymer beads may be optionally treated to confer ion exchange property (col. 6, lines 46- 49). Furthermore, backbone monomer, porogen, and stabilizing agent were taught within the scope of the present claims (col. 4, lines 16-45; col. 5,

lines 22-29, 50-67). Prior art further discloses and exemplifies hydrolysis of poly(ethyl acrylate) beads to form a weak acid cation ion exchange resin suitable for separating transition metal ions as contemplated by applicants (col. 6, lines 51-63; col. 10, Example 2). Accordingly, the instant invention is anticipated in view of prior art disclosure.

Accordingly, it would have been obvious to one having ordinary skill in the art to formulate the composite amine groups-containing polymeric beads as taught, motivated by the reasonable expectation of success. The intended function of being capable of complexing a transition metal cation would be inherent in prior art products because of the presence of the amine functionality in the polymeric bead products. Once the amine functionality is provided, it would necessarily perform the same function.

The Office Action maintains the position that the polymer bead product disclosed in the Ballard reference is identical to the presently-claimed polymer bead product, and was made by the same method. However, this reference fails to disclose or make any suggestion whatsoever that the disclosed polymeric beads could be used as a complexing resin, let alone that the polymeric beads are actually complexed with transition metal cation as now claimed.

The rejection relating to the Ballard reference appears to be more an inherent anticipation objection than one of obviousness. In particular, the Office Action notes that the "intended function of being capable of complexing a transition metal cation would be inherent in the prior art products because of the presence of the amine functionality in the polymeric bead products. Once the amine functionality is provided, it would necessarily perform the same function." However, the text from line 54 at column 3 to line 12 at column 4 of the Ballard reference clearly teaches that a "functional monomer" is to be used when preparing ion-exchange resins. The amine "functional monomers" referred to at line 5-12 in column 4 are therefore disclosed in a manner that teaches the skilled addressee to convert them into ion-exchange sites and not to retain them in an unmodified form to thereby function as complexing sites.

Nevertheless, even though it has been shown above that the reference did not inherently anticipate the rejected claims, in an attempt to progress prosecution of the

application, the Applicants have amended the claims as set forth above. By redefining the polymeric beads as being in a "complexed" form, it can no longer be argued by the Office that such polymeric beads are inherently provided in the Ballard reference. As there is no disclosure or suggestion whatsoever of using the polymeric beads disclosed in the Ballard reference as complexing resins, there can clearly be no teaching in the document directing the skilled addressee to the form of the complexed polymeric beads defined in the amended claims of the present application. Accordingly, these claims are believed to be both novel and non-obvious in the light of the Ballard reference.

In addition, the ability of the resins claimed herein to complex transition metal ions in the presence of background ions under high flow conditions provides unexpectedly improved results that overcome any obviousness that might exist.

#### **The Nonstatutory Double Patenting Rejection**

Claims 19-21 stand rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3-4 and 6 of U.S. Patent No. 6,171,489. The Office Action alleges that "[a]lthough the conflicting claims are not identical, they are not patentably distinct from each other because the instant claims encompass those in the cited patent."

As previously argued, even if the instant claims did encompass the present claims, this would not be proper grounds for an obviousness-type double patenting rejection. See MPEP Section 804 II, which states:

Domination and double patenting should not be confused. They are two separate issues. One patent or application "dominates" a second patent or application when the first patent or application has a broad or generic claim which fully encompasses or reads on an invention defined in a narrower or more specific claim in another patent or application. Domination by itself, i.e., in the absence of statutory or nonstatutory double patenting grounds, cannot support a double patenting rejection. *In re Kaplan*, 789 F.2d 1574, 1577-78, 229 USPQ 678, 681 (Fed. Cir. 1986); and *In re Sarrett*, 327 F.2d 1005, 1014-15, 140 USPQ 474, 482 (CCPA 1964). However, the presence of domination does not preclude



double patenting. See, e.g., *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968).

MPEP Section 804 II B 1(a) sets the standard for determining whether or not obviousness-type double patenting exists:

If the application at issue is the later filed application . . . a one-way determination of obviousness is needed in resolving the issue of double patenting, i.e., whether the invention defined in a claim in the application would have been anticipated by, or an obvious variation of the invention defined in a claim in the patent. See, e.g., *In re Berg*, 140 F.3d 1438, 46 USPQ2d 1226 (Fed. Cir.1998).

As discussed above in connection with the rejection under 103(a) over this reference, there is no teaching whatsoever in the claims of the '489 reference, or anywhere in the specification of this reference, that would in any way lead a person skilled in the art to prepare polymeric beads complexed with a transition metal cation. Thus, the present claims are not obvious over the claims of this reference. Withdrawal of the double patenting rejection is therefore respectfully requested.

### **Conclusion**

In view of the foregoing arguments and amendments, withdrawal of the rejections is respectfully requested. This application appearing to be in condition for allowance, passage to issuance is also respectfully requested. It is believed no fee is due with this submission. If this is incorrect, however, please deduct the amount needed for this Response, including any extension of time required, from deposit account 07-1969.

Respectfully submitted,

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